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Docket #
NHTSA-2002-11398-4



July 19, 2002

The Honorable Jeffrey W. Runge, M. D.
Administrator
National Highway Traffic Safety Administration
400 Seventh Street, S.W.
Washington DC 20590

DEPT. OF TRANSPORTATION
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RE: Petition for Rulemaking

**49 CFR Part 572, Anthropomorphic Test Devices
49CFR Part 571.208, Occupant Crash Protection**

Dear Dr. Runge:

The Alliance of Automobile Manufacturers (Alliance) hereby petitions the National Highway Traffic Safety Administration (NHTSA) to amend the specifications for anthropomorphic test devices in 49CFR Part 572 and the requirements of FMVSS No. 208, Occupant Crash Protection. Specifically, we petition for the following changes:

Amend Part 572 to add two (2) new subparts to set out specifications for the Occupant Classification Anthropomorphic Test Devices (OCATD 5 and OCATD 6).

Amend FMVSS 208 specifications to allow alternative use of OCATD 5 and OCATD 6 for manufacturer certification to static suppression test requirements.

Proposed amendments to 49 CFR Part 572 and FMVSS 208 that would incorporate the OCATD dummies for optional use by manufacturers in certifying vehicles to the static tests for automatic airbag suppression are presented in Attachments 1 and 2 respectively. Proposed additions are underscored; proposed deletions are struck through.

Background

Federal Motor Vehicle Safety Standard (FMVSS) 208 mandates passenger airbag systems for frontal impacts that either suppress deployment when a child is present or deploy in a low risk manner. One aspect of the standard specifies that suppression systems may be tested using either Hybrid III dummies or human volunteers who approximately match the body sizes of the small adult female and six-year-old Hybrid III dummies.

The development of suppression systems that rely on occupant sensing and characterization systems, in part, to suppress airbag deployment when the corresponding seating position is not occupied by a normally positioned adult, has been hampered by a lack of suitable surrogates for human occupants. Some occupant

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classification systems use seat surface pressure distribution as one input to the classification algorithm. Previous investigations at the University of Michigan Transportation Research Institute (UMTRI) have shown that existing human surrogates, such as the Hybrid-III and THOR crash dummies, do not produce humanlike seat surface pressure distributions (Reed et al. 1999b). Development and testing of occupant classification systems also requires testing surrogates in a wide range of postures, but many postures that are possible for humans cannot be attained with crash dummies. In particular, the Hybrid III dummies are difficult to position and may not appear human-like to some types of sensor systems used for occupant classification. Testing with human volunteers which is time-consuming and requires large numbers of subjects reduces repeatability to a level that is unacceptable for product development and would not provide the objectivity of compliance should the vehicle subsequently be tested with different human beings. [What does this suggest about the field performance]

The development of the OCATDs was motivated by this recognition that crash test dummies are poorly suited to the development and certification of the occupant classification components of some advanced airbag systems. OCATDs were developed to be quantitatively representative of humans in the corresponding anthropometric categories with respect to external anthropometry, skeletal linkage, body mass, and segment mass distribution. Most importantly, these devices are designed to produce seat surface pressure distributions that are quantitatively representative of human vehicle occupants.

Initial research conducted at UMTRI, began with a detailed study of the body dimensions and surface contours of the typical six-year-old child. This information was used to determine the anthropometric specifications for the six-year-old OCATD (OCATD 6). Following on, the seat surface pressure distributions produced by sixty-eight children and small women were measured in a range of seats and postures to determine the pressure distribution performance targets for both the OCATD6 and the small-adult-female OCATD (OCATD 5). OCATD prototypes were then evaluated with respect to these quantitative performance targets. This study demonstrated qualitative differences between the seat surface pressure distributions produced by humans and crash dummies, but did not quantify those differences. The Technical report describing this program is Appendix A to this petition.

A second research program at UMTRI conducted quantitative comparisons of the seat surface pressure distributions and weight distributions produced by the small adult female and six-year-old Hybrid III dummies. These were measured and compared to those produced by human occupants and the OCATDs (Reed et al. 2000). The quantitative comparison was made using pressure-distribution parameters that were demonstrated in the previous research to have value for occupant classification. In this study, the positions of the surrogates were recorded using a coordinate measurement machine to quantify the repeatability of the installation procedures. In addition, the support forces under the feet of the surrogate were recorded to evaluate the extent to which the weight borne by the seat varies with posture.

Both the Hybrid IIIs and OCATDs were found to be reasonably representative of similarly sized humans, but the OCATD6 performance was slightly better than the six-year-old Hybrid III on some parameters. In repeated trials, the coefficient of variance of pressure distribution parameters for all surrogates was generally less than five percent, compared with a 30 percent difference in target values between the child and adult surrogates. Positioning repeatability was better for the child surrogates than for the adult surrogates. The pressure distribution and foot support forces produced by the adult surrogates are strongly influenced by foot position.

The OCATD6 and OCATD5 have demonstrated comparable performance to the Hybrid III 6 year old and 5th percentile female ATDs for purposes of occupant classification using pressure distribution discrimination. The OCATDs may have the added advantage of superior flexibility and posture capability compared to the Hybrid III devices.

The results provided quantitative guidance to manufacturers for selecting surrogates and developing test procedures for use with advanced airbags. The technical report describing the program is Appendix B to this petition.

For all the above reasons the Alliance of Automobile Manufacturers petitions NHTSA to amend 49 CFR Part 572 And FMVSS 208 to permit optional use of the OCATD 5 and OCATD 6 dummies to certify vehicles to the static suppression test requirements of FMVSS 208.

The Alliance is prepared to join in appropriate discussion, testing or data analysis that will expedite agency action on this petition.

Sincerely,



Robert S. Strassburger
Vice President
Vehicle Safety & Harmonization
Alliance of Automobile Manufacturers

attachments